PEACE/WILLISTON
FISH & WILDLIFE
COMPENSATION
PROGRAM

BC hydro

BRITISH COLUMBIA

A Reconnaissance Survey of Unnamed Lake (Bluff Hill Lake # 2)

K. Mathias
March 1997

PWFWCP Report No. 158

The Peace/Williston Fish & Wildlife Compensation Program is a cooperative venture of BC Hydro and the provincial fish and wildlife management agencies, supported by funding from BC Hydro. The Program was established to enhance and protect fish and wildlife resources affected by the construction of the W.A.C. Bennett and Peace Canyon dams on the Peace River, and the subsequent creation of the Williston and Dinosaur Reservoirs.

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Website: *www.bchydro.bc.ca/environment/initiatives/pwcp/*

This report has been approved by the Peace/Williston Fish and Wildlife Compensation Program Fish Technical Committee.

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A RECONNAISSANCE SURVEY OF

UNNAMED LAKE (BLUFF HILL LAKE # 2)

WATERSHED:	Williston Reservoir (Finlay Reach)
DATE OF SURVEY:	August 25-26, 1996
FIELD CREW LEADER:	Karin Mathias
FIELD ASSISTANT:	Wayne Cook
REPORT PREPARED BY:	Karin Mathias
REPORT EDITTED BY:	Mark Hunter

BRITISH COLUMBIA CONSERVATION FOUNDATION

PEACE / WILLISTON FISH AND WILDLIFE COMPENSATION PROGRAM

B. C. MINISTRY OF ENVIRONMENT, LANDS AND PARKS

FUNDED BY: FOREST RENEWAL BRITISH COLUMBIA

LAKE: Unnamed Lake (Bluff Hill Lake # 2)

LAKE DRAINAGE

General:

Bluff Hill Lake # 2 is fed by one inlet, entering the lake at the south end. The lake is drained to the northeast by an unnamed outlet creek that flows for 1 km to an unnamed lake. The unnamed outlet of this lake flows for 0.5 km before it joins another unnamed creek. This creek flows for 1.6 km to an unnamed pond. The unnamed outlet of this pond flows for 3.0 km before entering the Finlay Reach of the Williston Reservoir. All distances are approximations.

Major Systems:

There are no major systems.

Minor Systems:

Inlet # 1 - Unnamed Creek

Inlet # 1 enters Bluff Hill Lake # 2 on the south side of the lake. A total of 450 m of Inlet # 1 was surveyed on foot and the complete length of Inlet # 1 (approximately 1 km) was surveyed by helicopter. From 145 m upstream to the inlet mouth, Inlet # 1 is very braided with shallow flow over thick clay / mud and occasional gravel / cobble. The mouth of Inlet # 1 (Plate # 6) is a braided delta of thick clay / mud. At 150 m upstream of Bluff Hill Lake # 2, there is a falls with a height of 0.25 m that is most likely passable to fish moving upstream. The scour pool below falls # 1 was 0.15 m deep. A second falls at 155 m upstream of the lake is 0.45 m high, with a 0.24 m deep scour pool below. Falls # 2 may be passable to fish moving upstream during high flows, but passage at the time of survey was unlikely. In this section of Inlet # 1, the riparian vegetation is sparse, consisting of grasses and small shrubs.

From approximately 155 m to 200 m upstream of the lake, Inlet # 1 flows through low banks of cobble / boulder with a maximum depth of 0.2 m. A third set of falls consisting of two "steps", with a total height of 1.4 m, is located 200 m upstream of the lake (Plate # 7). The downstream "step" is 0.5 m high with a 0.5 m deep scour pool below, and the upstream "step" is 0.9 m high, with a 0.35 m deep scour pool below. Although the downstream "step" is likely passable to fish at the time of survey, it is unlikely that the upstream "step" is passable to the upstream movement of fish even at high flows. Falls 4, located approximately 260 m upstream of Bluff Hill Lake # 2, appeared to be passable to fish at the time of survey, although passage would be much easier at higher flows. The height of falls # 4 is 0.55 m, with a pool depth of 0.25 m below. From approximately 260 m to 300 m upstream of Bluff Hill Lake # 2, Inlet # 1 has low banks of large cobble / boulder averaging 0.15 m in height, an average channel width of 3.0 m,

LAKE: Unnamed (Bluff Hill Lake # 2) **SYSTEM NAME:** **Finlay River**

A.S.A.P. REFERENCE NO.: **WATERSHED CODE: 230-9980-171**

DATA ON FILE FOR THIS SURVEY

Location	X	Dissolved O_2 / Temp. Profiles	X
Physical Data	X	Winter Dissolved O_2 / Temp. Profiles	--
Bench Mark	X	Netting Record	X
Terrain Features	X	Lake Catch Summary	X
Access	X	Individual Fish Data	X
Resorts and Campsites	X	Fish Preserved	--
Other Developments	X	Stomach Analysis	X
Obstructions and Pollutions	X	Scale Reading	X
Special Restrictions	X	Location of Inventory Sites	X
Aquatic Plants	X	Photograph Directory	X
Wildlife Observations	X	Appendices	
Miscellaneous Comments	X	A: Water Chemistry Analysis	X
Lake Drainage	X	B: Tributary Stream Data	X
Fisheries Management Comments	X	C: Fish Scale Analysis	X
History of Previous Surveys	X	Bathymetric Map Reduction	X
Water Chemistry Summary	X	Bathymetric Map	--

LOCATION

Location:	approximately 73 km south-southeast of Fort Ware		
Elevation:	790 m ± 10 m	U.T.M.:	10.375679.6301785
Latitude / Longitude:	56°50'36" 125°02'17"	N.T.S. Map No.:	94 C/14 edition 2
Management Unit:	7-40	Biogeoclimatic Zone:	Boreal Black and White Spruce
Ecoprovince:	Sub-Boreal Interior	Ecoregion:	Northern Canadian Rocky Mountains
Ecosection:	Cassiar Ranges		

Drainage: Unnamed C. --> Unnamed L. --> Unnamed C. --> Unnamed P. --> Unnamed C. --> Williston Reservoir (Finlay Reach) --> Peace R.

PHYSICAL DATA

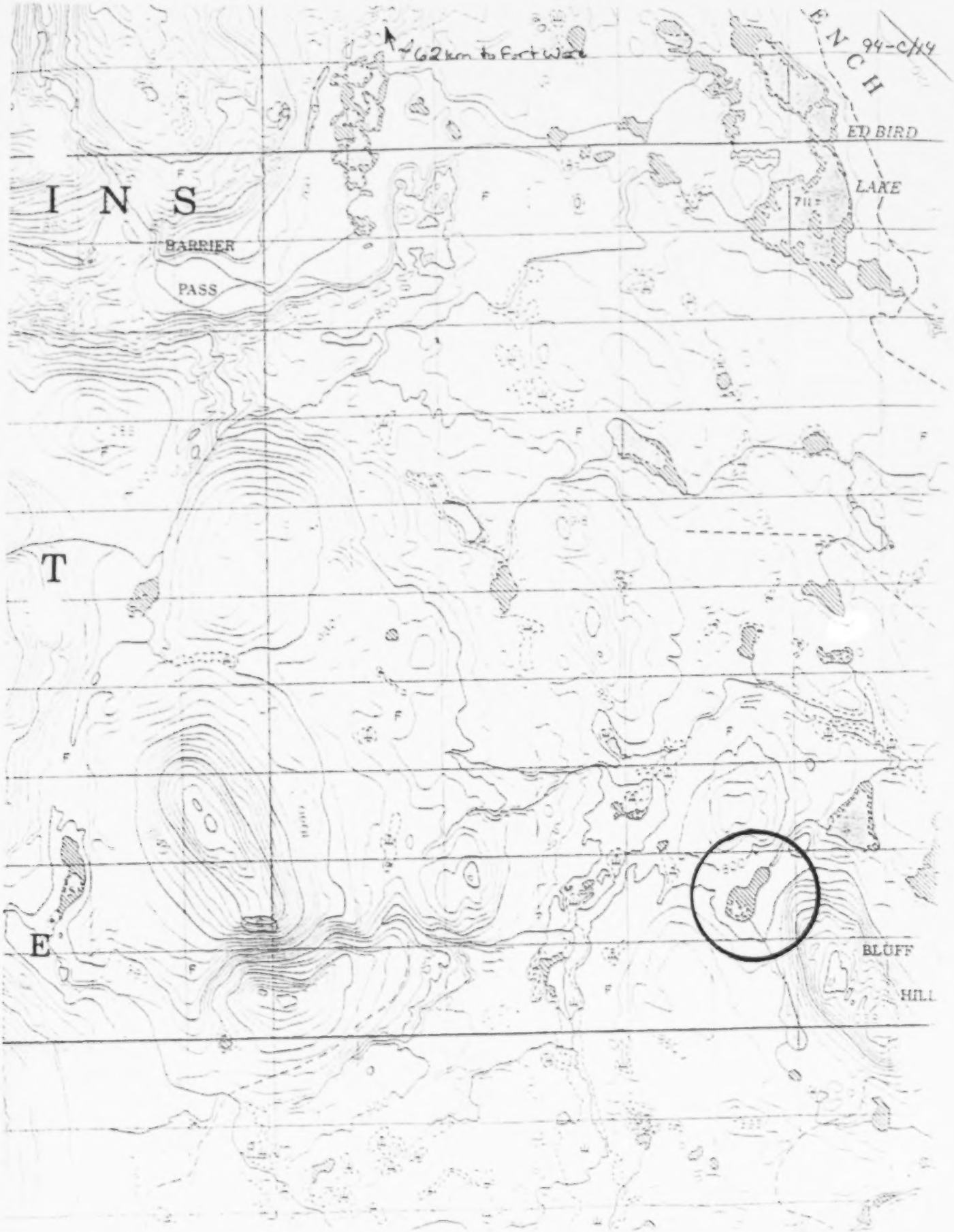
Lake Drainage Area:	3.9 km^2	Volume:	15 663 m^3
Water Surface Area:	139 304 m^2	Perimeter of Islands:	0 m
Area Above 6 m Contour:	139 304 m^2	Number of Islands:	0
Shoreline Perimeter:	1944 m	Mean Depth:	1.1 m
Maximum Depth:	3.5 m	Secchi Reading:	2.2 m
Filterable Residue (TDS):	250 mg/L		

Sounding Device: Lowrance X-15 Elevation Source: Contour Interpolation

BENCHMARK

(Iron spike, center of red circle) located 2.0 m above present water level in a 22 cm diameter spruce tree that is 1.2 m from the present water's edge, located on the southwest side of the lake, approximately 125 m west of Inlet # 1 (Plate # 5).

High Water Mark: 0.0 m above water level at time of survey


~62km to Fort Wak
94-C/14
ENCH
ED BIRD
LAKE
I N S
BARRIER
PASS
T
E
BLUFF
HILL

LAKE: Unnamed Lake (Bluff Hill Lake # 2)

TERRAIN FEATURES

Immediate Shoreline:

The shoreline slope of Bluff Hill Lake # 2 is very low around the whole lake, except for a short distance along the northwest shore, where the slope becomes moderately low. A "floating" bog is situated at the southwest end of the lake, consisting mainly of sphagnum moss and scrub birch, and fronted by sedge grasses and reeds. Most of the shoreline is fronted by sedge grasses, with Labrador tea (Ledum groenlandicum) growing behind, backed by a mature forest of spruce and lodgepole pine trees. Buck bean (Menyanthes trifoliata) was also found commonly around the edge of the lake. A beaver hut is situated on the southeast shore, near the mouth of Inlet # 1.

The shoreline substrate around the whole lake consisted of thick silts and organics. The lake bottom drops off very slowly from the shore around the whole lake.

Surrounding Country:

Bluff Hill Lake # 2 is surrounded by a mature forest of lodgepole pine and spruce trees, except for a boggy area at the northeast end of the lake, adjacent to the outlet creek, which consists exclusively of spruce trees. Spruce trees tend to be the dominant species to the southwest and southeast Bluff Hill Lake # 2, with lodgepole pine trees tending to be dominant to the northwest and the northeast of the lake. The forest along the rest of the shoreline consists of equal parts spruce to Lodgepole pine trees. A high bluff, gazetted as Bluff Hill, is located approximately 1 km to the southeast of Bluff Hill Lake # 2. High mountain peaks are visible in the distance to the northeast of the lake. Rolling hills surround the rest of Bluff Hill Lake # 2. A gravel logging road crosses the outlet of Bluff Hill Lake # 2, approximately 240 m downstream of the lake, connecting a cut block situated to the north of the lake with a future cut area to the east-southeast of the lake. Bluff Hill Lake # 2 is situated within the Boreal Black and White Spruce biogeoclimatic zone.

Bluff Hill Lake # 2 is one of five lakes that surround Bluff Hill. Bluff Hill Lake # 1 drains into Bluff Hill Lake # 2, which in turn drains into Bluff Hill Lake # 3. The other two Bluff Hill Lakes are joined by an unnamed creek. The outlet of Bluff Hill Lake # 4 drains into the outlet from Bluff Hill Lake # 3.

LAKE: Unnamed Lake (Bluff Hill Lake # 2)

ACCESS

Directions:

From it's junction with Highway 39, proceed south on Highway 97 for approximately 1.5 km, and turn right on to the Finlay Forest Service Road. Proceed north for approximately 200 km to Mesilinka Camp, then continue on the Finlay-Chunamon Forest Service Road for another 144 km to Swannell Camp, approximately 17 km west of the Ingenika Arm barge landing. The total distance from the junction of Highway 97 and Highway 39 to Swannell Camp is approximately 335 km. From Swannell Camp, Bluff Hill Lake # 2 is approximately a 14 km helicopter ride to the northeast.

Alternatively, the Ingenika Arm can be crossed by barge. If this is done, then on the north side of the Ingenika Arm, continue on the Finlay Forest Service Road for approximately 10 km, and turn left onto the Finlay-Pelly Lake Forest Service Road (Pelly Mainline). After approximately 5 km, turn left (in a cut block) and proceed for approximately 3 km to the second cut block. Bluff Hill Lake # 2 is approximately a 1.5 km helicopter ride to the south.

Barge transportation can be arranged with Finlay Navigation Inc. who can be reached in Prince George at (250) 964-3525 and in Mackenzie at (250) 997-3525. Actual barge pick-up times may vary greatly from the predicted pick-up time.

The Pelly mainline and cut block conditions were not investigated for this lake inventory and the distances given may not be accurate. Up to date Forest Plan Maps should be consulted before accessing Bluff Hill Lake # 2 from the north side of the Ingenika Arm.

Road Type and Conditions:

Highway 97 is a well-maintained, two-lane provincial highway. The Finlay Forest Service Road, and the Finlay-Chunamon Forest Service Road from 0 km to 79 km, is a well-maintained, two-lane gravel road that can be easily traveled with a two-wheel drive vehicle during the summer. After approximately 79 km, near Factor Ross Creek, the road becomes quite narrow and very windy. The Finlay Forest Service Road north of the Ingenika Arm is a well-maintained, two-lane gravel road that can be easily traveled with a two-wheel drive vehicle during the summer. The Finlay-Pelly Lake FSR (Pelly Mainline) conditions are unknown as Bluff Hill Lake # 2 was accessed by helicopter from Swannell Camp.

Restrictions:

Although there are no restrictions, it is recommended that a truck radio be used when traveling the gravel roads.

LAKE: Unnamed Lake (Bluff Hill Lake # 2)

RESORTS AND CAMPSITES

There were no resorts or campsites on Bluff Hill Lake # 2 at the time of survey.

OTHER DEVELOPMENTS

None noted.

OBSTRUCTIONS AND POLLUTIONS

None noted.

SPECIAL RESTRICTIONS

None known.

AQUATIC PLANTS

The following aquatic plants were identified in Bluff Hill Lake # 2 during the time of survey:

sedge grasses
smartweed (Polygonum sp.)
small pondweed (Potamogeton pusillus)
variableleaf pondweed (Potamogeton gramineus)
whitestem pondweed (Potamogeton praelongus)
Chara sp.
coontail (Ceratophyllum)
buck bean (Menyanthes trifoliata)

WILDLIFE OBSERVATIONS

The following wildlife or wildlife signs were seen/heard during the time of the survey:

frogs
beaver (possible - heard night sounds)
northern hawk owl (possible - call was heard)
mallard ducks (2 females)

LAKE: Unnamed Lake (Bluff Hill Lake # 2)

MISCELLANEOUS COMMENTS

1) Bathymetric map: The lake outline was drawn from an enlargement of air photo BCB 93053: No. 220, flown on August 10, 1993.

2) Many of the distances given in the directions to Bluff Hill Lake # 2 (in the Access section) have been taken from the Mackenzie South Forest District Recreation map and thus distances are approximations only.

3) The following aquatic organisms were observed in abundance in Bluff Hill Lake # 2:
   * dragonfly adults
   * large snails

4) Much of the shoreline to the southeast and northwest has terrain suitable for camping, or for a potential Forest Recreation Site

and an average wetted width of 1.5 m. The riparian vegetation in this area of stream consists of grasses, Equisetum sp., and small shrubs.

From 300 m to 325 m upstream of the lake, the amount of blow down in the channel increases, and the channel width extended to 25 m, both possibly due to a freshet washout. The wetted width of Inlet # 1, however, remains an average of 1.0 m. From approximately 325 m to 450 m, the banks, composed of gravely soil, gains a height of 3.5 m, and the average channel width is reduced to 4.0 m, 1.0 m of which is wetted. Abundant blow down of large spruce trees rest on the banks, crossing over the inlet channel. The average depth of Inlet # 1 in this area is 0.1 m, and the substrate consists of cobbles over gravel with many boulders interspersed. The riparian vegetation in this highly disturbed section of Inlet # 1 is sparse, consisting mainly of grasses, Equisetum sp., and small shrubs. It appears that Inlet # 1 had been recently washed out, probably during the last spring freshet, by the blow out of an upstream obstruction. When Inlet # 1 was surveyed by helicopter, the evidence of a blown out debris jam or beaver dam was observed approximately 800 m to 900 m upstream of Bluff Hill Lake # 2, about 100 m to 200 m downstream of an unnamed lake.

A Stream Survey card was completed for a sample site located approximately 295 m upstream of Bluff Hill Lake # 2 (Plate # 8). The average wetted width is 1.2 m and the average maximum riffle depth is 0.07 m. The substrate is composed of gravels (50%), cobbles (20%), fines (20%), and boulders (10%). The creek morphology is all riffle, with a gradient of 5.0%. The water temperature at the time of survey was 16.0 °C. For additional information, refer to Appendix B.

Outlet - Unnamed Creek

The outlet creek drains Bluff Hill Lake # 2 out of the northeast end of the lake (Plate # 9). The outlet, from the mouth to 25 m downstream of the lake, flows through a sedge grass swamp and has a substrate of thick silt / organics covered with Chara sp. and variableleaf pondweed. The channel has an average wetted width of 5 m and an average depth of 2 m. Beaver dam # 1, situated 25 m downstream of the lake, is 0.3 m in height, 25 m long, and appeared to be passable to fish moving upstream at the time of survey. Most of the dam's length is overgrown with grasses. Between beaver dam # 1 and beaver dam # 2, located approximately 80 m downstream of the lake, the outlet channel characteristics are similar to 0 m to 25 m downstream. Beaver dam # 2, also overgrown with grasses, is 0.2 m high, 5 m long, and appeared to be passable to fish at the time of survey.

From approximately 80 m to 110 m downstream of Bluff Hill Lake # 2, the outlet channel narrows to an average wetted width of 1.5 m, but remains an average of 1.5 m deep (the silt / organics extended approximately 2 m deeper). Less aquatic vegetation is growing in this section of channel. Beaver dam # 3, located approximately 110 m downstream of the lake, is 0.2 m high and 10 m long. Beaver dam # 3, overgrown with grasses, appears to

be partly washed out where the outlet flowed over the dam, and was passable to fish at the time of survey. Downstream of beaver dam # 3, the wetted channel characteristics remain consistent with those before the dam, except for the evidence of recent flooding indicated by the abundance of organic debris washed 10 m away on the right bank (looking upstream). This flooding may be due to the recent wash out of Inlet # 1. Approximately 210 m downstream of Bluff Hill Lake # 2, beaver dam # 4 forms a small pond (10 m by 15 m). Beaver dam # 4 is 0.25 m high, 15 m long, and was passable to fish at the time of survey through a chute washed out by the outlet creek.

At approximately 240 m downstream of Bluff Hill Lake # 2, a bridge crosses the outlet creek (Plate # 10). From the upstream end of the bridge to at least 290 m downstream of the lake, the banks change from sedge grass swamp to moss covered soil and the outlet channel substrate changes from silts to mainly of large gravels, cobbles and boulders, likely due to the road construction. Much of this substrate could provide ideal rainbow trout spawning habitat. The average wetted width for this area of creek is 0.5 m and the average depth is 0.3 m. Blow down is common in this area and the riparian vegetation consists mainly of grasses, Equisetum., scrub birch, alder and spruce trees.

A Stream Survey card was completed for a sample site located approximately 290 m - downstream of Bluff Hill Lake # 2 (Plates # 11 and # 12). The average wetted width is 0.9 m and the average maximum riffle depth is 14.7 cm. The substrate is composed of cobbles (50%), boulders (30%), gravels (15%), and fines (5%). The creek morphology consists of 50% run and 50% riffle, with a gradient of 4.0%. The water temperature at the time of the survey was 16 °C. For additional information, refer to Appendix B.

LAKE: Unnamed Lake (Bluff Hill Lake # 2)

FISHERIES MANAGEMENT COMMENTS

Bluff Hill Lake # 2 supports a good sized population of rainbow trout. These trout appeared to be quite healthy and had very few gill lice and other parasites. Lake chub also inhabit the lake. The inlet (Inlet # 1) appeared to have been recently eroded, possibly by a blow out of an upstream obstruction during the last freshet. Inlet # 1 had little fisheries potential since it had very little spawning habitat suitable for rainbow trout (substrate was generally too large), and had four sets of falls high enough to obstruct fish movement. The outlet creek, downstream of the bridge (at 240 m downstream of the lake), contained gravel suitable for rainbow trout spawning. In addition, good juvenile rearing habitat was present for most of the outlet creek length, whereas little existed in the recently eroded inlet. Evidence of fishing (fishing line and garbage) was observed on the outlet creek near the road.

HISTORY OF PREVIOUS SURVEYS

Lake Surveys:

None known.

Other Related Studies:

None known.

LAKE: Unnamed Lake (Bluff Hill Lake # 2)

WATER CHEMISTRY SUMMARY **Limnology Station No. 1**

Field Conditions:

Date:	August 25, 1996		
Time:	1235 hrs	Air Temperature:	21.0 °C
Wind Velocity:	5-8 km/h	Wind Direction:	from the northeast
Cloud Cover:	0/10 o.c.	Surface Conditions:	small waves
Secchi Disc:	2.2 m	Water Colour:	clear with green-brown tinge

Method Used:

Dissolved Oxygen:	YSI Model 58 Oxygen / Temperature Meter
Water Temperature:	YSI Model 58 Oxygen / Temperature Meter
Air Temperature:	Hand-Held Alcohol Thermometer
pH (field):	Digital pH Pocket Tester
H_2S (field):	Hach H_2S Field Test Kit
Laboratory Used:	Pacific Environmental Science Center
Water Sampler:	Vertical Alpha Water Bottle (Vandorn)
Metal Sampler:	By Hand; Preserved With 2.0 mL Nitric Acid
Substrate Sampler:	Substrate Sample Not Taken

Water Sample Chemistry: **SEAM Site No.: E223146**

	Sampling Depths	
	Surface (0.5 m)	Lower (2.5 m)
Alkalinity (lab)	205 mg/L	206 mg/L
Filterable Residue 105°C (lab)	250 mg/L	250 mg/L
H_2S (field)	N/A	0.0 mg/L
Nitrogen - Total (lab)	0.46 mg/L	0.56 mg/L
Non-Filterable Residue (lab)	< 5 mg/L	< 5 mg/L
pH (field)	8.3	7.6
pH (lab)	8.4	8.3
Phosphorus - Total Dissolved (lab)	0.005 mg/L	0.004 mg/L
Specific Conductance (lab)	375 uS/cm	375 uS/cm

Bottom Depth: 3.5 m

Substrate Sample Depth: N/A (substrate consisted of thick silts and organics).

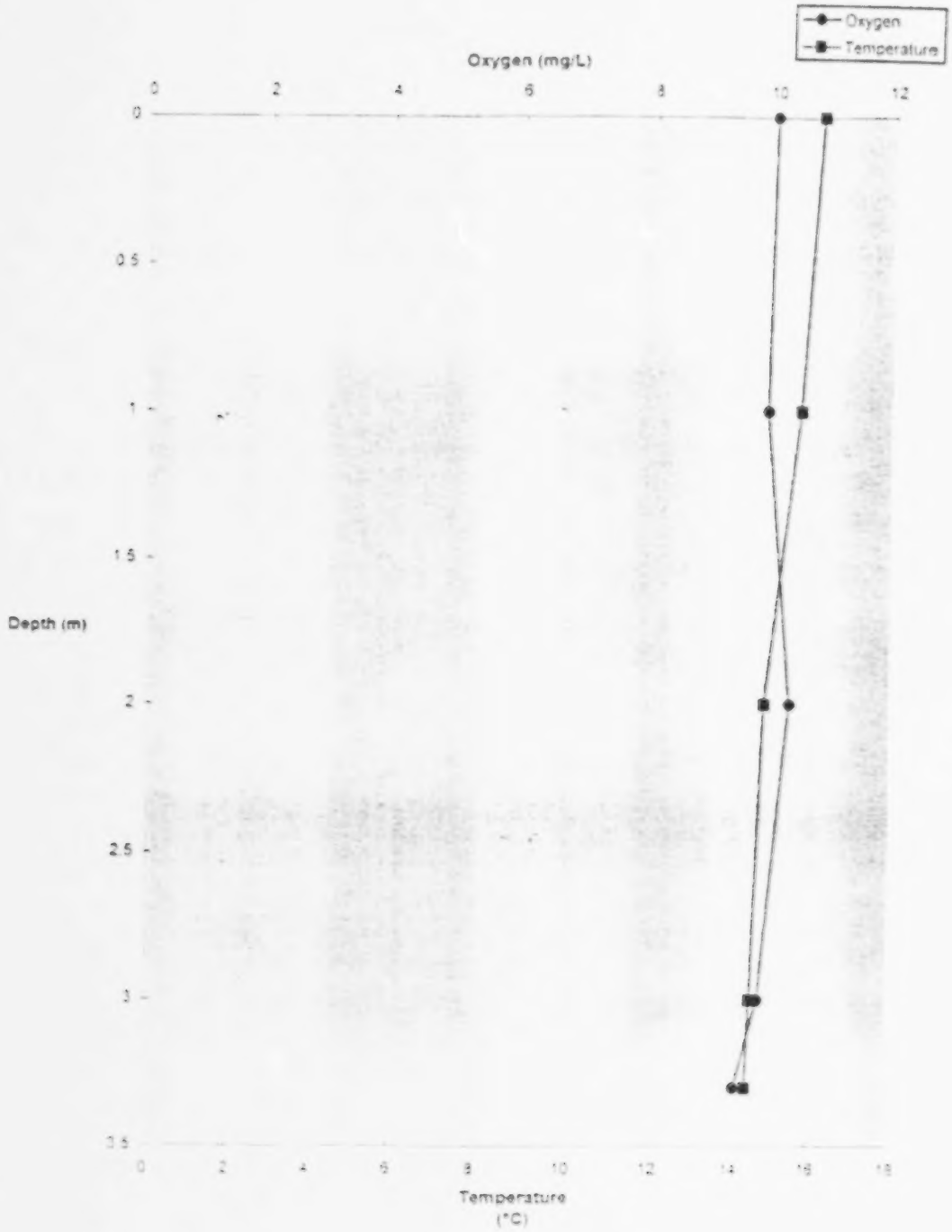
* additional analyzed parameters and results, including metals, are found in Appendix A

LAKE: Unnamed Lake (Bluff Hill Lake # 2)

SUMMER OXYGEN / TEMPERATURE DATA

DEPTH (m)	O_2 (mg/L)	TEMPERATURE (°C)
Surface	10.0	16.2
1.0	9.9	15.7
2.0	10.3	14.8
3.0	9.8	14.5
3.3	9.4	14.4
3.5	Bottom	

SUMMER OXYGEN / TEMPERATURE PROFILE



LAKE: Unnamed Lake (Bluff Hill Lake # 2)

NETTING RECORD

Mesh Size Experimental Order: 25, 76, 51, 89, 38, 64 mm

NETTING SITE # 1

Type:	Sinking Monofilament Gill Net			
Date Set:	August 24, 1996		Time:	1640 hrs
Date Lifted:	August 25, 1996		Time:	1015 hrs
Net Dimensions:	Length:	91.4 m	Depth:	2.4 m
Shallow End Mesh Size:	25 mm		Depth:	0.75 m
			Substrate:	thick silt / organics
Deep End Mesh Size:	64 mm		Depth:	2.5 m
			Substrate:	thick silt / organics

Comments: The net started approximately 2.5 m from the shore.

LAKE CATCH SUMMARY

Species	Netting Site No. 1	Angled	Other	Total	Number Sampled	Number Preserved	Size Range (cm)
RB	39	0	0	39	30	0	10.0-40.9
LKC	19	0	0	19	0	0	10.6-12.2

MINNOW TRAPS:

Bait: Sardines

Trap No.	Hours	Depth (m)	Substrate	Species	No. Caught	Size Range (cm)
1	4:09	0.9	Chara over silts/organics	LKC	44	5.0-9.0
2	4:09	1.0	Pondweed over silts/organics	LKC **RB**	2 55	12.0-14.0 4.6-8.7
3	4:05	0.9	Chara over silts/organics	LKC	25	5.3-8.2
4	4:06	1.1	Pondweed over silts/organics	LKC RB	1 32	13.5 5.1-7.8

LAKE: Unnamed Lake (Bluff Hill Lake # 2)

INDIVIDUAL FISH DATA

Date Captured: Aug. 25, 1996

Method: Sinking Monofilament Gillnet

M - Male
F - Female
? - Not Obvious

IMM - Immature
MG - Maturing
MT - Mature
GV - Gravid
SP - Spent
? - Not Obvious

EG - Egg
FR - Fin Ray
HD - Head
ML - Milt
OT - Otolith
SC - Scale

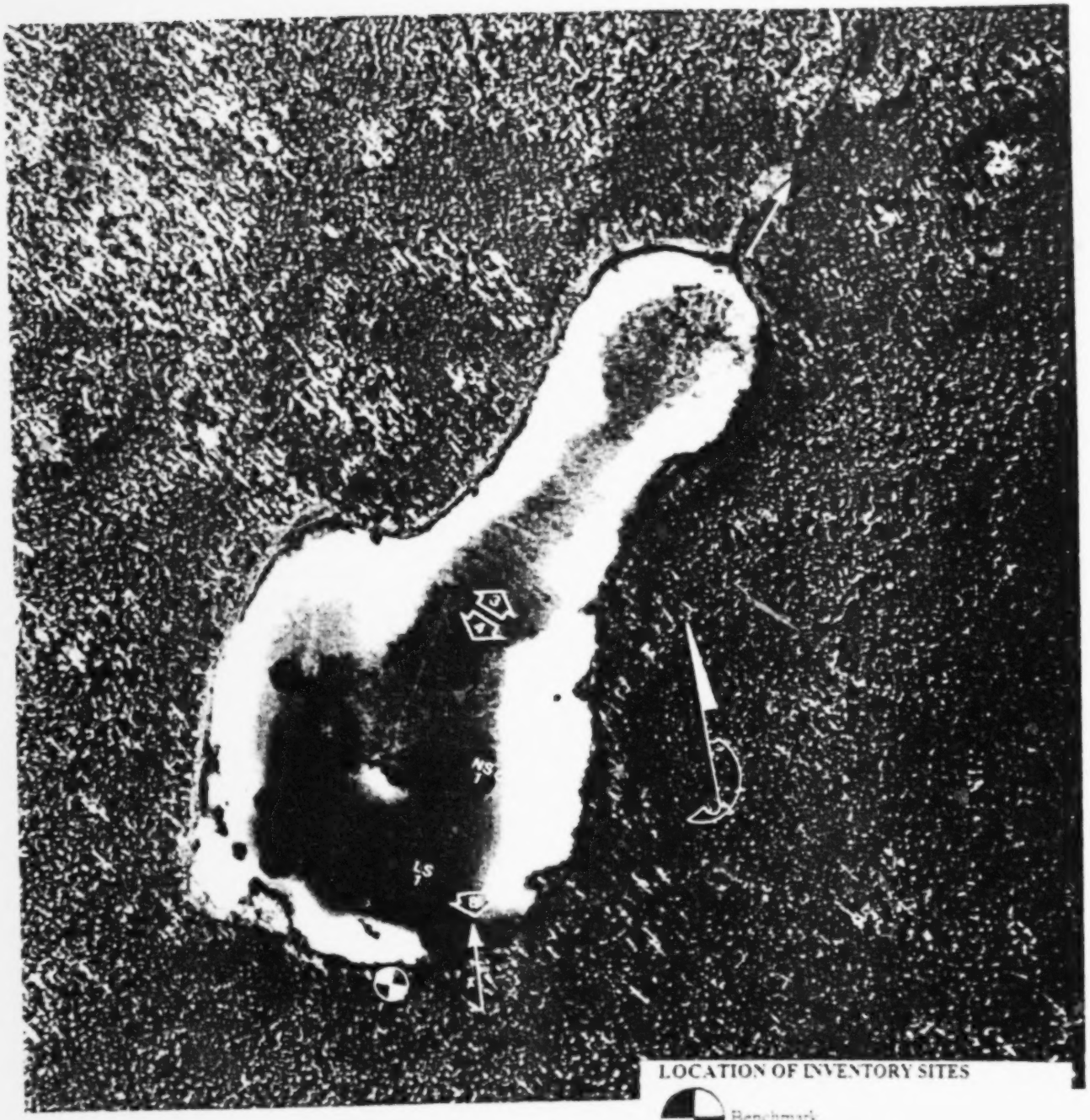
Species	Fork Length (cm)	Weight (grams)	Sex	Gonadal Maturity	Sample Type	Age (yr)	Stomach Contents				Comments
							Plankton	Insects	Fish	Other	
RB	40.9	896.0	M	MG	SC	2+		B			Li
RB	24.4	190.0	F	IMM	SC	2+		DF			
RB	35.7	540.0	M	MG	SC	2+		B			
RB	34.7	548.0	F	MG	SC	3+		DF			
RB	31.8	429.0	M	MG	SC	2-3+*		CF			Li
RB	20.9	140.0	M	MG	SC	2+					empty
RB	32.4	428.0	F	MG	SC	2+		DF			
RB	22.7	157.0	M	IMM	SC	2+*		DF			
RB	12.6	23.0	M	IMM	SC	1+		Di		O	
RB	12.3	21.0	M	IMM	SC	1+		Di		O	
RB	11.8	13.5	M	IMM	SC	1+					empty
RB	24.8	220.0	F	MG	SC	3+		DF		L	Li
RB	27.1	255.0	F	MG	SC	**					empty
RB	23.0	182.0	F	MG	SC	2+		B			
RB	39.0	705.0	F	MG	SC	4+					empty, Li
RB	28.1	293.0	F	MG	SC	**		DF			Li
RB	30.6	368.0	M	MG	SC	3+		DF			Li
RB	32.0	425.0	F	MG/SP	SC	3+		CF			
RB	10.0	9.0	M	IMM	SC	1+				L	
RB	24.3	187.0	M	MG	SC	2+		DF			TW on K
RB	31.7	392.0	F	MG/SP	SC	2+		CF			TW in St
RB	26.1	249.0	F	MG	SC	2+			WF		
RB	32.6	414.0	F	MG/SP	SC	**		B			
RB	35.4	560.0	F	MG/SP	SC	2+		CF		O	
RB	25.1	211.0	M	MG	SC	3+		B			TW in St
RB	27.0	235.0	F	MG/SP	SC	3+					empty
RB	18.8	102.0	M	IMM	SC	1+		DM			Parasite on St
RB	19.6	100.0	M	MG	SC	2+		DF			
RB	18.6	79.0	M	IMM	SC	2+*		A, Di			
RB	21.7	139.0	M	IMM	SC	***					empty

B - Beetle
C - Clams
CF - Caddis Fly
Ch - Chaoborus
DF - Dragonfly
Cr - chironomids
Da - *Daphnia*
Di - Diptera
G - *Gammerus*
DM - Damselfly
L - Leech
Li - Lice
O - Organics
S - Snails
A - Terrestrial Ant
St - Stomach
TW - Tape Worm
WB - Water Boatman
WF - Whole Fish
K - Kidney

* scale partially regenerated - estimated age

** scale regenerated - no age given

*** scale age not returned



LOCATION OF INVENTORY SITES

Benchmark

Stream Number And Direction Of Flow

Net Set Number And Site

Limnostation Number And Site

Plate Number And Direction Of Photograph

LAKE: Unnamed Lake (Bluff Hill Lake # 2)

PHOTOGRAPH DIRECTORY

Plate	Roll : Number	Description
1	22: 9	Aerial view of Unnamed Lake (Bluff Hill Lake # 2) looking southwest.
2	22: 10	Aerial view of Unnamed Lake (Bluff Hill Lake # 2) looking northeast. Note the cut block to the north, the Unnamed Lake (Bluff Hill Lake # 3) approximately 1 km to the northeast, and the Finlay Reach of the Williston Reservoir in the distance.
3	22: 12-13	Panoramic view of Unnamed Lake (Bluff Hill Lake # 2) looking northeast towards the outlet, taken from the centre of the lake.
4	22: 15-16	Panoramic view of Unnamed Lake (Bluff Hill Lake # 2) looking southwest, taken from the centre of the lake.
5	23: 8	View of the benchmark located 2.0 m above the present water level in a 22 cm diameter spruce tree that is 1.2 m from the present water's edge and located on the southwest side of the lake approximately 125 m west of Inlet # 1.
6	23: 3	View of the mud / clay mouth of Inlet # 1 where it enters Unnamed Lake (Bluff Hill Lake # 2) at the south end of the lake.
7	22: 21	View of falls # 3 on Inlet # 1, located 200 m upstream of Unnamed Lake (Bluff Hill Lake # 2). Total height of fall # 3 was 1.4 m, with the "steps" measuring 0.5 m and 0.9 m (looking upstream).
8	23: 2	Downstream view of the sample site on Inlet # 1, taken approximately 310 m upstream of Unnamed Lake (Bluff Hill Lake # 2).
9	23: 15	View of the mouth of the outlet where it drains Unnamed Lake (Bluff Hill Lake # 2) from the northeast end of the lake.
10	23: 12	Upstream view of the bridge crossing the outlet of Unnamed Lake (Bluff Hill Lake # 2), located approximately 240 m downstream of the lake.
11	23: 13	Upstream view of the sample site on the outlet, taken approximately 300 m downstream of Unnamed Lake (Bluff Hill Lake # 2).
12	23: 14	Downstream view of the sample site on the outlet, taken approximately 280 m downstream of Unnamed Lake (Bluff Hill Lake # 2).

LAKE: Unnamed Lake (Bluff Hill Lake # 2)

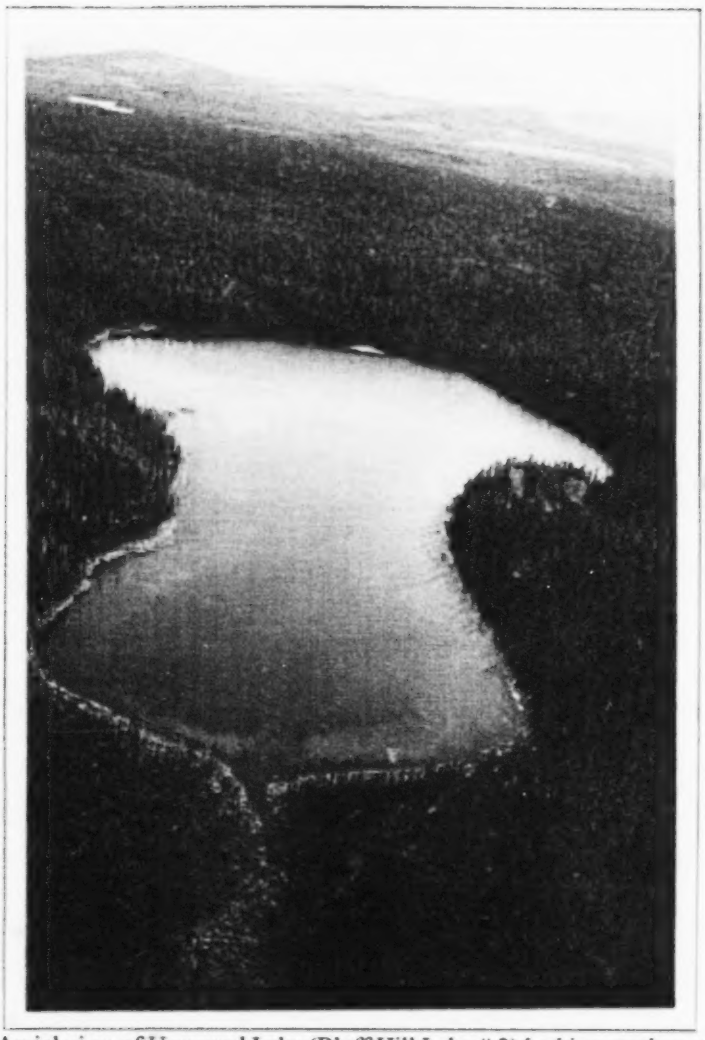


Plate # 1: Aerial view of Unnamed Lake (Bluff Hill Lake # 2) looking southwest.

LAKE: Unnamed Lake (Bluff Hill Lake # 2)

Plate # 2: Aerial view of Unnamed Lake (Bluff Hill Lake # 2) looking northeast. Note the cutblock to the north, Unnamed Lake (Bluff Hill Lake # 3) approximately 1 km to the northeast, and the Finlay Reach of Williston Reservoir in the distance.

LAKE: Unnamed Lake (Bluff Hill Lake # 2)

Plate # 3: Panoramic view of Unnamed Lake (Bluff Hill Lake # 2) looking northeast towards the outlet, taken from the center of the lake.

LAKE: Unnamed Lake (Bluff Hill Lake # 2)

Plate # 4: Panoramic view of Unnamed Lake (Bluff Hill Lake # 2) looking southwest, taken from the center of the lake.

Plate # 5: View of the benchmark located 2.0 m above present water level in a 22 cm diameter spruce tree that is 1.2 m from the present water's edge and located on the southwest side of the lake approximately 125 m west of Inlet # 1.

LAKE: Unnamed Lake (Bluff Hill Lake # 2)

Plate # 6: View of the mud / clay mouth of Inlet # I where it enters Unnamed Lake (Bluff Hill Lake # 2) at the south end of the lake.

LAKE: Unnamed Lake (Bluff Hill Lake # 2)

Plate # 7: View of falls # 3 on Inlet # 1, located 200 m upstream of Unnamed Lake (Bluff Hill Lake # 2) . Total height of falls # 3 was 1.4 m, with the "steps" measuring 0.5 m and 0.9 m (looking upstream).

LAKE: Unnamed Lake (Bluff Hill Lake # 2)

Plate # 8: Downstream view of the sample site on Inlet # I, taken approximately 310 m upstream of Unnamed Lake (Bluff Hill Lake # 2).

Plate # 9: View of the mouth of the outlet where it drains Unnamed Lake (Bluff Hill Lake # 2) from the northeast end of the lake.

LAKE: Unnamed Lake (Bluff Hill Lake # 2)

Plate # 10: Upstream view of the bridge crossing the outlet of Unnamed Lake (Bluff Hill Lake # 2), located approximately 240 m downstream of the lake.

Plate # 11: Upstream view of the sample site on the outlet, taken approximately 300 m downstream of Unnamed Lake (Bluff Hill Lake # 2).

LAKE: Unnamed Lake (Bluff Hill Lake # 2)

Plate # 12: Downstream view of the sample site on the outlet, taken approximately 280 m downstream of Unnamed Lake (Bluff Hill Lake # 2).

Appendix A

LABORATORY REPORT

Water Chemistry Analysis

RESULTS FOR UNNAMED LAKE -PELLY LK #2 SAMPLES

Parameter Analyzed		Units	964408-001	964408-002
ALINITY		mg/l	205	206
CONDUCTIVITY		uS/cm	375	375
METALS/TOTAL (WATER-ICP)	AG	mg/l	<.01	-
	AL	mg/l	.08	-
	AS	mg/l	<.06	-
	B	mg/l	<.01	-
	BA	mg/l	.046	-
	BE	mg/l	<.001	-
	CA	mg/l	48	-
	CD	mg/l	<.006	-
	CO	mg/l	<.006	-
	CR	mg/l	.009	-
	CU	mg/l	<.006	-
	FE	mg/l	.141	-
	K	mg/l	1.3	-
	MG	mg/l	21.8	-
	MN	mg/l	.014	-
	MO	mg/l	<.01	-
	NA	mg/l	2.5	-
	NI	mg/l	<.02	-
	P	mg/l	<.1	-
	PB	mg/l	<.06	-
	SB	mg/l	<.06	-
	SE	mg/l	<.06	-
	SI	mg/l	2.53	-
	SN	mg/l	<.06	-
	SR	mg/l	.318	-
	TI	mg/l	.003	-
	V	mg/l	<.01	-
	ZN	mg/l	<.002	-
NITROGEN/AMMONIA		mg/l	.03	.013
/NITRITE		mg/l	<.002	<.002
/NITRITE+NITRATE		mg/l	.019	.004
/TOTAL		mg/l	.46	.56
PH		Rel.U.	8.40	8.32
PHOSPHORUS/O-PO4		mg/l	<.001	<.001
/TOTAL		mg/l	.012	.011
/TOTAL DISSOLVED		mg/l	.005	.004
RESIDUE/FILTERABLE		mg/l	250	250
/NON-FILTERABLE		mg/l	<5	<5
BC CLIENT STUDY CODE			20	20
SAMPLING AGENCY			91	91
SITE IDENTIFIER/NUMBER			E223146	E223146
COLLECTION START DATE		y/m/d	96/08/25	96/08/25
UPPER DEPTH		metres	0.5	2.5
TEMPERATURE ON ARRIVAL		deg.C	4	4

Appendix B

Tributary Stream Data

D.F.O. / M.O.E. Stream Survey Form

(2)

DFO / MOE
STREAM SURVEY FORM

Stream Name (pick): Unnamed Creek (local): Outlet of Pelly Lk #2 | Access: FT | Method:

Watershed Code: 23.0.99800.171 | Longitude:

Location: 290m D/S of Pelly Lake #2 | [redacted] | 1 | [redacted] | 20 | GF

UTM: 10 375679 6301700 | Y: N | E: [redacted]

Date: 96/08/26 | [redacted] 1030 | [redacted] | KM/WC/ | Photos: #13/#14 | Air Photos: 30 BCB 93053 No. 221

C	PARAMETER	VALUE	METH	SPECIFIC DATA
	[redacted]	0.9	ST	0.8, 0.8, 1.0
	[redacted]	0.9	ST	0.8, 0.8, 1.0
	Ave Max Riffle Depth (cm)	14.7	OM	15, 14, 15
	Ave Max Pool Depth (cm)	0	OM	
	Gradient %	4	SC	
	[redacted]	00 / 50 / 50 / 00	EE	
	[redacted]	00 / [redacted]	EE	
(3)	[redacted]	15 / [redacted]	EE	
	Stable %	5		
	COVER: Total %	50		
	Comp. Each 100%	Ds Rock: 0; LOD: 5; Shrubs (>1m): 20; Dec Veg: 0; Conifers: 25; Total: 50		
	Open Canopy %	10	E	Aspect: N

C	%
[redacted]	
[redacted]	5
[redacted]	5
[redacted]	10
[redacted]	10
[redacted]	40
[redacted]	50
[redacted]	00

D_{50} (cm): 25 | E | Compaction: L (M) H

C	BANKS	
(2)	Height (m): 3	Variable: 80
(1)	Texture: (F) G L R	
	Confinement: EN CO FC OC (UC) N/A	
	Valley Channel Ratio: 0-2 2-5 5-10 (10-) N/A	
	[redacted] Dry L (M) H Flood	
(4)	Flood Signs: Height (m): 0	Bankfull: Y (N)
	Bars %: 0	cm:
	Water Temp °C: 6.0	Turb. (cm): clear

Depth (cm): 0

Clarity (23°C):

DISCHARGE over 2.5 m

Parameter	Value	Method	Specific Data
Wetted Width (m)	1.1	ST	0.9, 1.1, 1.3
Mean Depth (m)	0.2	OM	.17, .14, .18, .21, .14
(5) Mean Velocity (m/s)	0.26	FAN	1.0, 0.1, 11.0 (sec) → 9.7 sec
Discharge (m³/s)	0.04	FAN	0.057 m³/s × 0.75

REACH SYMBOL (Fish):

Width (Valley Channel Ratio): | Bed Material:

Size	No.	Size Range (mm)		Use	

STREAM/VALLEY CROSS-SECTION (Looking Downstream) — L — R

PLANIMETRIC VIEW

COMMENTS

Channel Stability ✓ Debris ✓ Management Concerns ☐ Obstructions ☐ Riparian Zone ✓ Valley Wall Processes ☐ Etc.

(1) Banks are stabilized by moss and coniferous [illegible] - other vegetation

(2) Banks are stable at present but may slump in future due to bank undercutting. (avg. 0.30 m) under each bank

(3) Stable is LOD fallen across and into stream channel

(4) No flood signs visible - channel likely floods much [illegible] lake [illegible] D/S

(5) [illegible] 2.5 m [illegible] only due to narrow wetted width.

Sorted by:

Date:

Appendix C

FISH SCALE ANALYSIS

Age Determination Completed By:

A.M.C. Technical Services Ltd.
Melinda M. Hirst
6809 Phillip Road.
Lantzville, B.C.
VOR 2H0

SEE ORIGINAL COPY

FOR SCALE SAMPLE READINGS

ORIGINAL COPY IS HELD BY

B. C. MINISTRY OF ENVIRONMENT, LANDS AND PARKS

PRINCE GEORGE, B. C.

Appendix D

BATHYMETRIC MAP

Reduced to
34%
of Original Size
STATISTICS AT TIME OF SURVEY
Unnamed Lake
(Bluff Hill Lake # 2)